

FIVE-YEAR REVIEW REPORT

**BIG RIVER SAND COMPANY
WICHITA, KANSAS**

Prepared by:

**U.S. Environmental Protection Agency
Region 7
Kansas City, Kansas**

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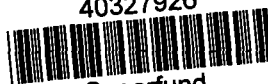


**Michael J. Sanderson
Director, Superfund Division**

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1.0 INTRODUCTION

This report documents the five-year review conducted by the U.S. Environmental Protection Agency (EPA), the lead agency at the Big River Sand Company site in Wichita, Kansas, to determine if the final remedy is still protective of human health, welfare, and the environment. A five-year review is being conducted at the Big River Sand Company site as stated in the Record of Decision (ROD) that was issued on June 28, 1988. Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and Section 300.430 (f)(4)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) require that periodic reviews (at least once every five years) be conducted for sites where hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use or unrestricted exposure following the completion of all remedial actions for the site. This type of five-year review is referred to as a statutory review. A second type of five-year review is referred to as a policy review. A policy review is one that the EPA believes should be conducted, as a matter of policy, although they are not required by CERCLA Section 121(c). The five-year review at the Big River Sand Company site has been determined, since the issuance of the ROD in June 1988, to be a policy review. The purpose of these reviews is to determine the continued adequacy of the final remedy in providing protection of human health, welfare, and the environment.

The EPA has established four levels of review. Level III requires the most in-depth review and would be appropriate for sites where there is the greatest likelihood that the remedial actions are no longer protective of human health, welfare, and the environment. Level II is a less intensive review, and Level I is appropriate for sites where it is least likely that the remedial actions are no longer protective. A Level Ia review is intended to streamline the five-year review process at sites where remedial action is ongoing and to reduce resource needs for such reviews. A Level Ia review is a modified version of a Level I review. This review of the Big River Sand Company site is a Level I review because it is anticipated that the selected remedy for this site is still protective of human health, welfare, and the environment.

2.0 SITE BACKGROUND

2.1 Site Location and History

The Big River Sand Company site is located in the south half of Section 2, Township 27 South, Range 1 West, in Sedgwick County, Kansas, just northwest of the city limits of Wichita (Figure 2-1). The site is east of Hoover Road and North of 21st Street, approximately ½ mile west of the Arkansas River and adjacent to the Wichita Valley Center Floodway (Figure 2-2).

The site consists of approximately 123 acres, half of which has been extensively mined for sand and gravel. The site includes two property owners: Mr. Vic Eisenring and the Big River Sand Company. Mr. Eisenring, former owner of the entire site, currently owns the eastern

portion and the Big River Sand Company owns the western portion (Figure 2-3). Located onsite is the Big River Sand Company office and the Eisenring office and residence.

Land use adjacent to the site is a mixture of agricultural and residential. Approximately 25 residences are located west of the site and two residences are to the south. Land use to the north is predominantly agricultural. Adjacent to the site on the east is the floodway and the Arkansas River.

This site is located within the Arkansas Valley, which is characterized by extreme flatness and poorly developed surface drainage of the Arkansas River floodplain. Unconsolidated silt, sand and gravel deposits form an extensive groundwater aquifer parallel to the Arkansas River Valley. The unconsolidated deposits onsite are approximately 48 feet thick. The depth to groundwater ranges from 7 to 14 feet below the ground surface. The regional and site groundwater flow is in a southeasterly direction towards the Arkansas River. The velocity of groundwater flow in the alluvial aquifer is very rapid, estimated to be about 1.9 to 3.4 feet per day.

During the early 1970's, approximately 2,000 drums of paint-related wastes were disposed of on the Eisenring property, adjacent to a five-acre sand quarry lake. In 1978, Mr. Eisenring sold about 80 acres of his property, which included the quarry lake and drum disposal area, to the Big River Sand Company. As part of the sales agreement, Mr. Eisenring began to transfer the drums to his adjacent property in 1982. Nearly 200 barrels were transferred before the Kansas Department of Health and Environment (KDHE) halted the action because Mr. Eisenring did not have a permit to store or dispose of the waste.

The KDHE conducted an initial site inspection in August 1982 and identified damaged, corroded and leaking drums. The KDHE sampled waste solvents and paint sludges from several drums and detected metals, including arsenic, cadmium, chromium, lead and selenium, and volatile organic compounds (VOCs), including toluene, ethyl benzene and trichloroethylene. Waste solvents from the barrels were determined to be hazardous waste due to the characteristic of ignitability. Paint sludges failed the EP Toxicity test for chromium.

In September 1982, KDHE issued an order to Mr. Eisenring to conduct a removal and site cleanup. From 1982 to 1984, the State provided oversight of the removal and site cleanup activities performed by Mr. Eisenring. Approximately 40 cubic yards of hazardous paint sludge were disposed of at the USPCI hazardous waste landfill in Oklahoma. About 10,000 gallons of solvent were recycled by Pratt and Lambert in Andover, Kansas. Non-hazardous material was disposed of at the Wichita Brooks Landfill.

Between 1982 and 1985, KDHE sampled soils, the quarry lake, residential drinking water wells, and monitoring wells. Arsenic, lead and selenium were detected in drinking water wells at concentrations greater than Maximum Contaminant Levels (MCLs) established by the Safe

Drinking Water Act. Concentrations of several metals detected in the onsite monitoring wells also exceeded MCLs. VOCs, including toluene, were detected in onsite soils and in monitoring wells.

The site was proposed for the National Priorities List (NPL) in October 1984 and in May 1986 was placed on the NPL.

A remedial investigation (RI) was conducted by EPA to determine the presence and extent of contamination remaining in soils, sediments, surface water and groundwater. The RI was also conducted to determine the need for further remedial response actions to protect public health and welfare and the environment. Additional objectives of the investigation were to define the geology and hydrogeology of the site, determine the direction and rate of groundwater flow, identify potential migration pathways and receptors, and to identify general response actions and potential remedial technologies for the site.

The initial site visit conducted in May 1986 confirmed that ongoing sand mining operations had removed most of the former 2,000-drum disposal area. The former 200-drum disposal area was in a natural vegetative state that included tall grass, scrub vegetation and small trees. Neither disposal area had signs of stressed vegetation or evidence of remaining drums. The site visit and information obtained from the Kansas Biological Survey did not identify any environmentally sensitive areas or threatened and endangered species in the vicinity.

In summary, the remedial investigation found metals in soil and groundwater above background levels, but not outside the range of metals that may be found naturally occurring in soil and groundwater. Selenium was detected at a concentration of 62 micrograms per liter ($\mu\text{g/L}$) in well E101S, exceeding the MCL of 10 $\mu\text{g/L}$. Selenium was not detected in any other monitoring wells or in any of the drinking water wells sampled.

2.2 Community Relations

Community interest in the site was quite high during 1982 and 1983. The local newspaper, The Wichita Eagle-Beacon, presented several articles regarding the removal and site cleanup.

Community concern lessened after the removal was completed in 1984. No citizen inquiries were made to local, State or Federal officials. During development of EPA's Community Relations Plan for the RI, interviews were conducted with officials and residents of the Wichita area in October 1985. Several residents living near the site indicated that they were not concerned about the site and had no complaints regarding their drinking water wells. Onsite remedial investigation activities conducted in 1986 and 1987 also did not generate any citizen inquiries.

Section 117(a) of CERCLA provides that a notice and brief analysis of the Proposed Plan must be published, and that the Proposed Plan be made available to the public. A notice and brief analysis of the Proposed Plan for the Big River Sand Company site was published on May 31, 1988, in The Wichita Eagle-Beacon. The public notice provided a brief overview of the site and identified the lead agency (EPA) and the support agency (KDHE). The notice informed the public of its role in the decision-making process and provided information on the public comment period, the location of the information repositories and methods by which the public could submit oral and written comments. The notice also presented the preferred alternative and requested public comments on the alternative. The public comment period began on May 31, 1988, and ended on June 20, 1988.

At the beginning of the public comment period, EPA met with officials from several local government agencies. The officials were provided copies of the Proposed Plan and an overview of site issues.

No comments were received by EPA or the State on the Proposed Plan, the preferred alternative or the Administrative Record file during the public comment period.

A Record of Decision (ROD) was signed on June 28, 1988, which selected the No Further Action alternative as the final remedy for the Big River Sand Company site. The EPA, in consultation with KDHE, determined that the site did not pose a significant threat to public health and welfare and the environment and, therefore, taking additional remedial measures was not appropriate.

After completion of the ROD, it was decided to start the process of deleting the Big River Sand Company site from the NPL. A notice of intent to delete the Big River Sand Company site from the NPL was placed in the Federal Register on July 9, 1992. The public was invited to comment on the proposed decision to delete this site from the NPL. No comments concerning the deletion of the site from the NPL were received during the public comment period. Therefore, the final notice deleting the site from the NPL was placed in the Federal Register on October 14, 1992.

2.3 Site Characteristics

Analysis of the RI data indicates that the primary type of contamination is metals and is largely confined to soils and groundwater.

Shallow Soil

Summarized in Table 2-1 are the analytical results for shallow soil samples collected during the RI from 12 locations. The sample from location SS-2 was used as a background sample for comparing sample results because it is upgradient of the site and in an area not

formerly used to store wastes. This background sample consistently had the lowest metal concentrations.

A statistical analysis of the analytical data for total metal concentrations collected during the RI is presented in Table 2-2. The data has been normalized by dividing the sample concentration by the background sample concentration. The sample value is then presented as a ratio of the background value, setting the background value at one. The relative magnitude of the concentrations compared to background are more easily evaluated in this manner. Some of the differences between normalized concentrations can be attributed to natural soil composition variability, which can be different for each compound. A large variation in only one compound value has a significant effect on the mean value.

In summary, the shallow soil samples were elevated for some metal concentrations relative to the upgradient sample. The elevated concentrations are anticipated to be due to paint waste spillage at the site. However, comparison of these concentrations to typical median values for soils throughout the United States indicates onsite shallow soils are similar to median soil concentrations across the country.

Subsurface Soil

Table 2-3 is a summary of the analytical results obtained during the RI for metals detected in the 11 split-spoon soil samples from the seven boreholes on the site. The composite sample (0 to 6-foot depth) from borehole B101S was used as a background sample for comparing the sample results because it is upgradient of the site and in an area not formerly used to store wastes. This background sample consistently had the lowest metal concentrations.

The concentrations for the 0 to 6-foot composite interval were normalized as described in Section 2.3, Shallow Soil, to the background sample concentration (Table 2-4).

In summary, the metal concentrations decrease with depth. This is apparently due to the adsorption of the metals onto the soil during vertical migration toward the groundwater. In comparison to soils throughout the United States, the split-spoon soil samples are well within a typical range for metal compounds.

Groundwater

Tables 2-5 through 2-8 are summaries of the analytical results obtained during the RI for total and dissolved metal concentrations in groundwater. The sample from monitoring well B101S was used as a background sample for comparing the sample results because it is upgradient of the site and in an area not formerly used to store wastes. The concentrations at this background location were the lowest of all the monitoring well samples; however, the concentrations in the private well samples were generally lower than the concentrations in monitoring wells.

The groundwater sample concentrations were normalized to the background sample concentration (Table 2-9) as previously described. The greatest variability occurred for selenium, zinc and magnesium. Metal concentrations did not vary significantly for each sample location; most of the variation may be attributed to natural variability in groundwater composition.

In summary, only one monitoring well, E101S, had a metal concentration which exceeded a primary drinking water standard. Selenium was detected at a concentration of 62 $\mu\text{g/L}$, exceeding the MCL of 50 $\mu\text{g/L}$. Selenium was not detected in any of the other monitoring wells or drinking water wells. A U.S. Geological Survey report on groundwater supplies in Kansas found 13 percent of wells sampled exceeded the MCL for selenium. The survey statistics were based on sampling 766 wells between 1976 and 1981.

3.0 SUMMARY OF RESPONSE ACTIONS

At the request of EPA, the Agency for Toxic Substances and Disease Registry (ATSDR) provided a Health Consultation for the site in November 1987. The ATSDR concluded, based on the RI data and information, that the site did not at that time appear to present a significant health threat. The ATSDR attributed this conclusion to the previous site mitigation activities, natural site flushing of contamination from the soils and rapid groundwater transport.

During the initial phase of the RI, preliminary remedial alternatives were developed. General remedial response actions were identified for such suspected contaminated media at the site and potential remedial technologies were selected. A Feasibility Study to develop and evaluate in detail the remedial alternatives was not conducted because the RI Report and ATSDR Health Consultation concluded that previous cleanup actions effectively eliminated any threats to the public health and welfare and the environment.

In a Record of Decision signed on June 28, 1988, the Regional Administrator for Region VII selected the No Further Action alternative as the final remedy for the Big River Sand Company Site. The EPA, in consultation with KDHE, determined that the site did not pose a significant threat to public health and welfare and the environment and, therefore, taking additional remedial measures was not appropriate.

4.0 CURRENT CONDITIONS

The Kansas Department of Health and Environment (KDHE), Bureau of Environmental Remediation (BER), was tasked by the EPA in Region VII to conduct a five-year review of the groundwater contamination associated with the Big River Sand Company site. The primary objective of the groundwater investigation was to evaluate current contaminant levels associated with the site. The scope of this investigation included collecting groundwater samples from two

monitoring wells and two private drinking water wells. Although release of volatile organic compounds and heavy metals into the groundwater supply has been documented by past investigations, the samples were collected to evaluate current levels of metals, particularly selenium, and determine whether the release has impacted additional targets beyond those identified in previous investigations.

On November 21-22, 1995, KDHE/BER personnel collected groundwater samples from two monitoring wells (B101S and E102S) and two private drinking water wells (Eisenring Shop and Eisenring Residence) associated with the Big River Sand Company site. An attempt was made to sample the site's key monitoring well, E101S, which in 1987, contained groundwater with 61 to 62 $\mu\text{g/L}$ of selenium. However, KDHE/BER was unable to sample this monitoring well either because of sediment fill up and/or collapse of the well casing.

4.1 Groundwater Samples

Four groundwater samples from two monitoring wells and two private drinking water wells were collected at the Big River Sand Company site. The analytical results for samples collected by KDHE/BER in November 1995, are compared with the 1987 analytical results from the RI, and MCLs and Secondary Maximum Contaminant Levels (SMCLs) in Table 4-1.

The quality of private drinking water in Kansas is not regulated by State or Federal agencies. The EPA and KDHE regulations apply to public drinking water supplies, but these standards can be used as guidelines for evaluating the quality of private drinking water supplies. MCLs are enforceable health-based standards for public drinking water supplies. SMCLs are secondary standards that apply to constituents which affect the aesthetic properties and desirability of water for drinking and domestic uses but are not believed to have health effects.

4.2 Total Metals

During the 1995 KDHE/BER sampling effort, total metals were identified in all of the four wells which were sampled. Both iron and manganese significantly exceed their respective SMCLs in the Eisenring residence well. Manganese exceeds its SMCL in the Eisenring shop well. Both iron and manganese are below their SMCLs in monitoring wells B101S and E102S and are significantly below maximum levels detected in 1987 (Table 4-1).

Trace levels of selenium were detected in only one of the four wells which were sampled. A selenium level of 2.07 $\mu\text{g/L}$, only slightly above the detection limit of 2.0 $\mu\text{g/L}$, was detected in monitoring well B101S, which is considered the background well for the site. KDHE/BER encountered an obstruction at 8.01 feet below ground surface in monitoring well E101S. As a result, KDHE/BER was unable to collect a groundwater sample from this key well.

Static water level was encountered at 9.05 feet below ground surface in monitoring well E101D, which is located only a few feet away from monitoring well E101S. According to Vic Eisenring, both monitoring wells E101S and E101D were under water during the spring floods of 1993 and 1995.

4.3 KDHE Conclusions

Groundwater elevation measurements reveal that groundwater flow associated with the Big River Sand Company site is moving toward the east-southeast in a direction away from, and perpendicular to, potential private drinking water well targets (Figure 4-2). This shallow, subsurface flow probably flushes and/or dilutes any contaminants released into the aquifer and carries them toward the Arkansas River where they are further diluted and carried down stream (Figure 4-3). There are no surface water intakes along the Arkansas River which supply drinking water, fisheries, sensitive environments and resources in the Wichita area.

5.0 STATEMENT OF PROTECTIVENESS

Based on the analytical results of the sampling conducted by KDHE/BER in November 1995, the selected remedy of No Further Action remains protective of the public health and welfare and the environment.

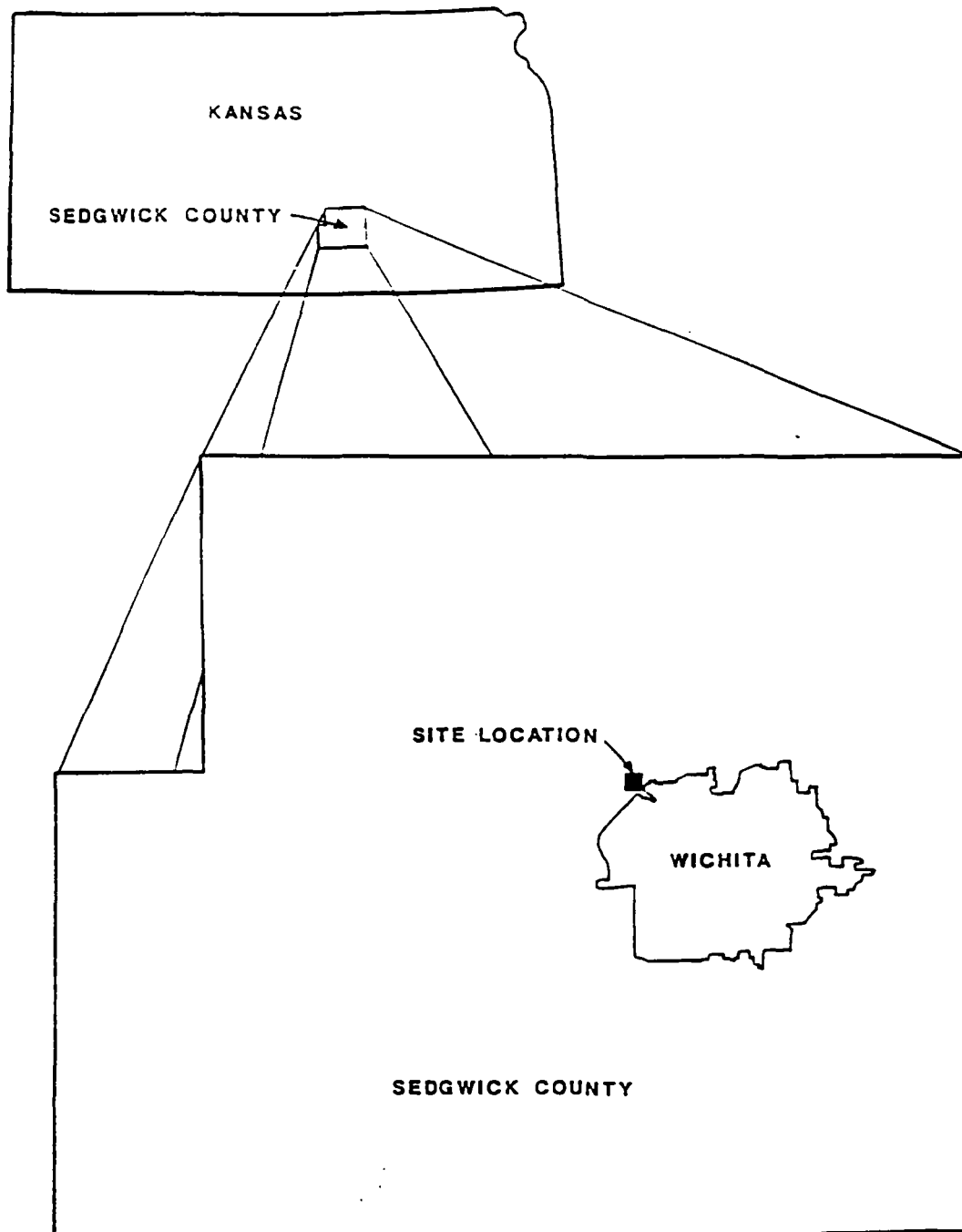
6.0 NEXT REVIEW

This report is the first Five-Year Review for this site. The next review is due in June 2003. For the next review, it is recommended that reasonable efforts be made to remove the obstruction from well E101S in order to sample the well. If the obstruction cannot be cleared, EPA and the state may decide to replace or abandon the well. If site conditions remain unchanged at the time of the next review, the next review will most likely be the final review for the site.

FIGURES

AND

TABLES



NOT TO SCALE

John Mathes & Associates, Inc.

SITE LOCATION MAP

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FIGURE 2-1

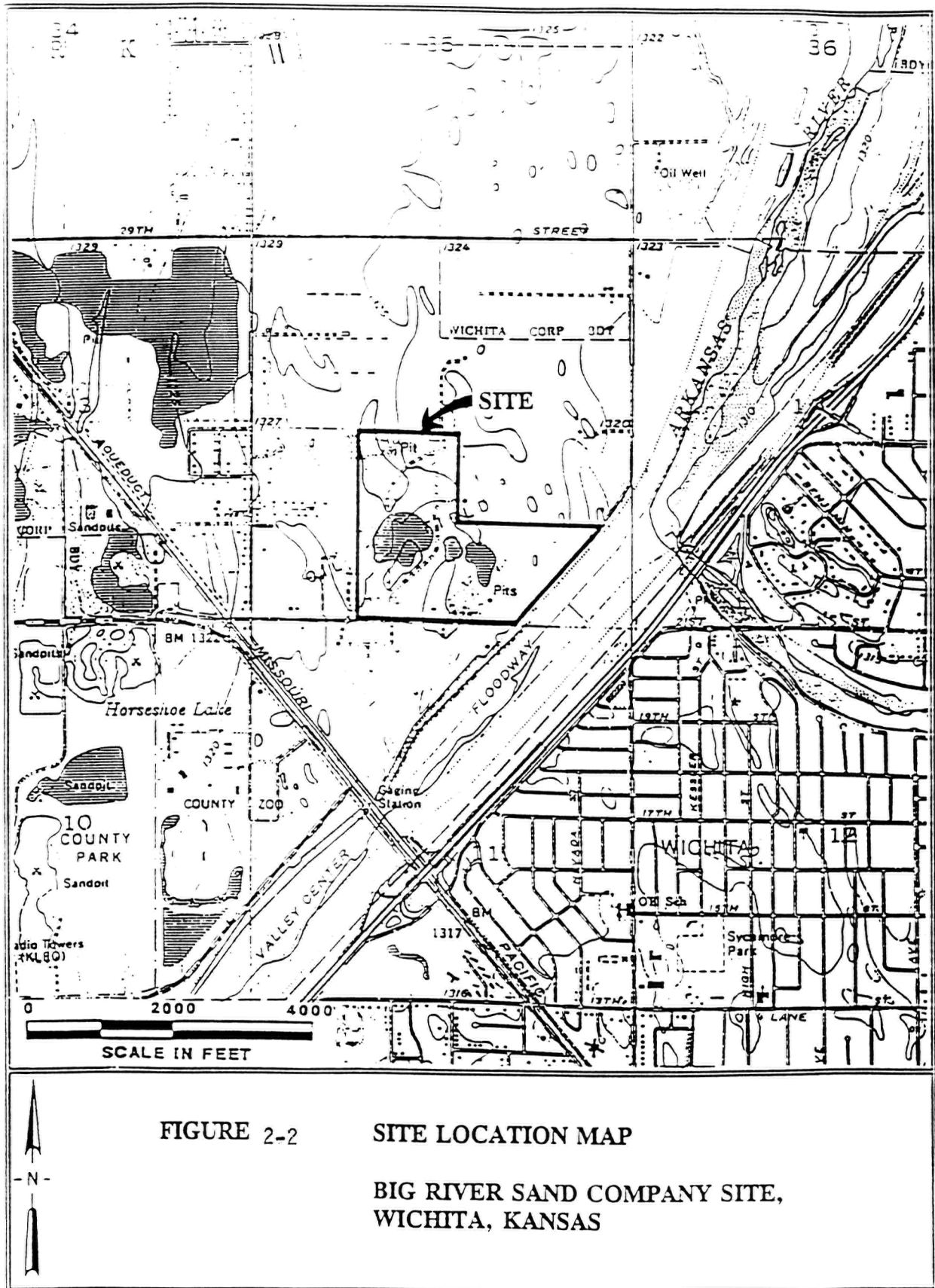
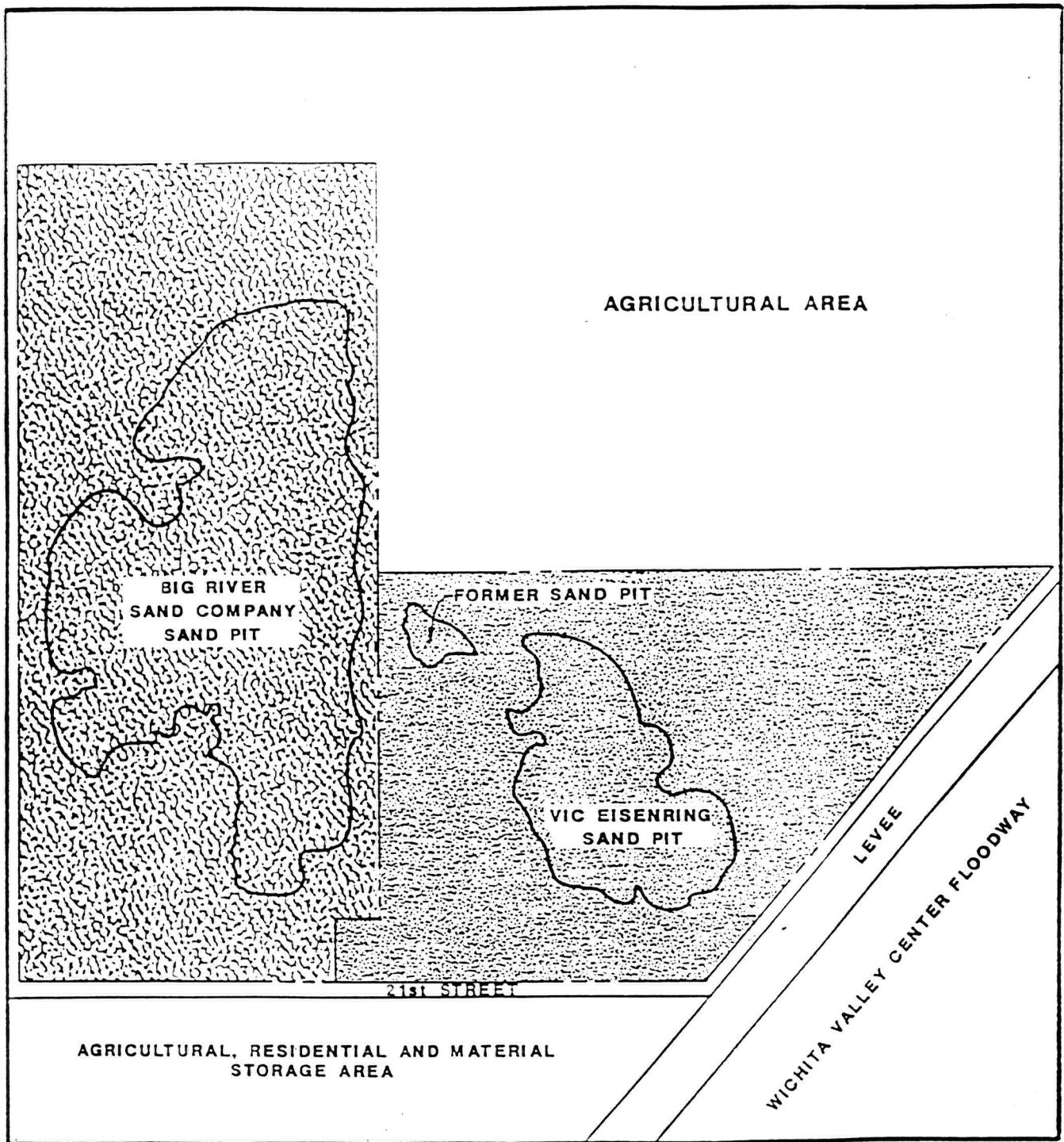


FIGURE 2-2

SITE LOCATION MAP

BIG RIVER SAND COMPANY SITE,
WICHITA, KANSAS



EXPLANATION



BIG RIVER SAND COMPANY PROPERTY



VIC EISENRING PROPERTY

----- APPROXIMATE SITE BOUNDARY (FENCED)

NOTE

Pit boundaries are based on aerial photography from May 1986.



John Mathes & Associates, Inc.

**SITE MAP FOR THE
BIG RIVER SAND COMPANY
SUPERFUND SITE**

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FIGURE 2-3

Table 2-1
TABLE OF TOTAL METAL CONCENTRATIONS IN
SHALLOW SOIL SAMPLES
BIG RIVER SAND COMPANY SUPERFUND SITE

Compound	Concentrations (mg/kg)						
	Sample Number						
	SS-1	SS-2	SS-2 Duplicate	SS-3	SS-4	SS-5	SS-6
Aluminum	7,500	2,900	2,000	8,000	9,900	2,900	3,900
Barium	94.0*	43.0*	29.0*	150	98.0*	66.0*	52.0*
Calcium	2,500*	940*	680*	15,000	2,200*	770*	1,100*
Chromium (PP)	8.00	<5.50	<5.40	6.9	8.60	12.0	<6.00
Copper (PP)	<16.0	<14.0	<14.0	<15.0	28.0	<14.0	<15.0
Iron	10,000	4,600	4,100	12,000	12,000	4,600	6,800
Lead (PP)	9.9	3.30	2.90	6.9	6.80	18.0	3.50
Magnesium	2,400*	740*	520*	3,300	2,200*	640*	910*
Manganese	200	54.0	35.0	200	130	68.0	74.0
Potassium	1,600*	490*	330*	760*	1700*	460*	530*
Tin	<25.0	<22.0	<22.0	<23.0	26.0	<22.0	<24.0
Zinc (PP)	30.0	9.30*	5.30*	33	30.0	110	8.90*

* Actual concentration, but less than CLP contract required detection limits.

(PP) = Priority Pollutant

Notes: 1. Samples are a composite of the 0- to 1-foot depth by location.
2. SS-2 is the background sample location.

Table 2-1 Continued
TABLE OF TOTAL METAL CONCENTRATIONS IN
SHALLOW SOIL SAMPLES
BIG RIVER SAND COMPANY SUPERFUND SITE

Compound	Concentrations (mg/kg)					
	Sample Number					
	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
Aluminum	4,600	1,900	4,600	8,800	10,000	8,300
Barium	70.0*	29.0*	56.0*	82.0*	170	110*
Calcium	1,700*	760*	1,200*	1,900*	23,000	13,000
Chromium (PP)	<6.00	<5.50	10.0	6.40	9.00	6.30
Copper	<15.0	<14.0	<14.0	<15.0	<15.0	<15.0
Iron	6,800	3,600	6,700	10,000	14,000	11,000
Lead (PP)	5.80	6.60	20.0	6.40	9.60	6.90
Magnesium	1,200*	550*	1,100*	2,000*	4,100	2,700*
Manganese	140	71.0	150	65.0	270	180
Potassium	810*	390*	1,000	1,500*	1,800*	1,500*
Tin	<24.0	<22.0	<23.0	<26.0	<32.0	<27.0
Zinc (PP)	16.0	8.90*	19	24.0	40	31

* Actual concentration, but less than CLP contract required detection limits.

(PP) = Priority Pollutant

Notes: 1. Samples are a composite of the 0- to 1-foot depth by location.
2. SS-2 is the background sample location.

Table 2-2
COMPARISON OF NORMALIZED SHALLOW SOIL SAMPLE CONCENTRATIONS
BIG RIVER SAND COMPANY SUPERFUND SITE

Compound	Normalized Concentration											
	Sample Number											
	SS-1	SS-2	SS-3	SS-4	SS-5	SS-6	SS-7	SS-8	SS-9	SS-10	SS-11	SS-12
Aluminum	3.06	1.00	3.27	4.04	1.18	1.59	1.88	0.78	1.88	3.59	4.08	3.39
Barium	2.61	1.00	4.17	2.27	1.83	1.44	1.94	0.81	1.56	2.28	4.72	3.06
Calcium	3.09	1.00	18.52	2.72	0.95	1.36	2.10	0.94	1.48	2.35	28.40	16.05
Chromium (PP)	1.47	1.00	1.27	1.58	2.20	1.10	1.10	1.01	1.83	1.17	1.65	1.16
Copper (PP)	1.14	1.00	1.07	2.00	1.00	1.07	1.07	1.00	1.00	1.07	1.07	1.07
Iron	2.30	1.00	2.76	2.76	1.06	1.56	1.56	0.83	1.54	2.30	3.22	2.53
Lead (PP)	3.19	1.00	2.23	2.19	5.81	1.13	1.87	2.13	6.45	2.06	3.00	2.23
Magnesium	3.81	1.00	5.24	3.49	1.02	1.44	1.90	0.87	1.75	3.17	6.51	4.29
Manganese	4.49	1.00	4.49	2.92	1.53	1.66	3.15	1.60	3.37	1.46	6.07	4.04
Potassium	3.90	1.00	1.85	4.15	1.12	1.29	1.98	0.95	2.44	3.66	4.39	3.66
Tin	1.14	1.00	1.05	1.18	1.00	1.09	1.09	1.00	1.05	1.18	1.45	1.23
Zinc (PP)	4.11	1.00	4.52	4.11	15.07	1.22	2.19	1.22	2.60	3.29	5.48	4.25
Sum:	34.31	12.00	50.42	33.86	33.77	15.97	21.84	13.12	26.95	27.59	70.04	46.94
Mean:	2.86	1.00	4.20	2.82	2.81	1.33	1.82	1.09	2.25	2.30	5.84	3.91

PP = Priority pollutant.

Notes: (1) Background sample concentration is the average of two samples collected at SS-2.
(2) Sample is a composite of the 0- to 1-foot depth.

Table 2-3

TABLE OF TOTAL METAL CONCENTRATIONS IN
SPLIT-SPOONED SOIL SAMPLES

BIG RIVER SAND COMPANY SUPERFUND SITE

Compound	Concentration (mg/kg)					
	Sample Number and Sample Depth					
	B101S 0-6 feet	B102D 0-6 feet	B102D Duplicate 0-6 feet	B102D 9-11 feet	B102D 14-16 feet	E101D 0-6 feet
Aluminum	590	6,100	4,800	4,200	570	8,300
Barium	18.0*	100*	91.0*	110*	16.0*	190
Calcium	420*	3,300	3,100	17,000	1,100*	20,000
Chromium (PP)	<5.1	6.80	6.6	6.80	<6.00	11.0
Iron	2,000	9,300	7,900	8,800	2,100	15,000
Lead (PP)	<2.60	8.70	7.6	6.6	3.3	6.1
Magnesium	300*	2,100*	1,500*	2,200*	350*	4,800
Manganese	64.0	290	250	150	44.0	430
Mercury (PP)	<0.1	<0.12	<0.12	<0.12	<0.12	<0.13
Tin	<20	<23.0	<23.0	<24.0	<24.0	<25.0
Zinc (PP)	5.0*	24.0	20.0	25.0	6.80*	49.0

* = Actual concentration, but less than CLP contract required detection limits.

(PP) = Priority Pollutant.

Note: B101S is the background sample location.

Table 2-3 Continued

TABLE OF TOTAL METAL CONCENTRATIONS IN
SPLIT-SPOONED SOIL SAMPLES

BIG RIVER SAND COMPANY SUPERFUND SITE

Compound	Concentration (mg/kg)				
	Sample Number and Sample Depth				
	E101D 9-11 feet	E101D 14-16 feet	E102S 0-6 feet	E102S 9-11 feet	E102S 14-16 feet
Aluminum	6,900	460	6,700	880	2,200
Barium	88.0*	8.60*	130	27.0*	70.0*
Calcium	3,200	540*	17,000	1,900*	8,200
Chromium (PP)	6.60	<5.50	7.90	3.20*	5.30*
Iron	10,000	880	11,000	3,200	5,400
Lead (PP)	11.0	2.90	8.70	5.50	4.60
Magnesium	2,300*	330*	2,700*	420*	1,200*
Manganese	86.0	13.0	270	54.0	84.0
Mercury (PP)	<0.12	<0.11	<0.12	<0.11	<0.14
Tin	<23.0	<22.0	<23.0	48.0	<27.0
Zinc (PP)	26.0	5.20*	32.0	8.80*	17.0

* = Actual concentration, but less than CLP contract required detection limits.

(PP) = Priority Pollutant.

Note: Table includes only samples and compounds measured above the detection limit.

Table 2-4
COMPARISON OF NORMALIZED SPLIT-SPOONED SOIL CONCENTRATIONS
BIG RIVER SAND COMPANY SUPERFUND SITE

Compound	Normalized Concentration			
	B101S	B102D	E101D	E102S
Aluminum	1.00	10.34	14.07	11.36
Barium	1.00	5.56	10.56	7.22
Calcium	1.00	7.86	47.62	40.48
Chromium (PP)	1.00	1.33	2.16	1.55
Iron	1.00	4.65	7.50	5.50
Lead (PP)	1.00	3.35	2.35	3.35
Magnesium	1.00	7.00	16.00	9.00
Manganese	1.00	4.53	6.72	4.22
Mercury (PP)	1.00	<1.20	<1.30	<1.20
Tin	1.00	<1.15	<1.25	<1.15
Zinc (PP)	1.00	4.80	9.80	6.40
Sum:	11.0	<51.77	<119.33	<91.43
Mean:	1.00	<4.71	<10.85	<8.31

(PP) = Priority pollutant.

(<) Symbol used to denote compound was reported at actual concentration of minimum detection limit and was below this limit.

Notes: (1) B101s was used as the background sample.

(2) Sample is a composite of the 0 to 6-foot depth.

Table 2-5

**TABLE OF TOTAL METAL CONCENTRATIONS IN
GROUNDWATER SAMPLES FROM MONITORING WELLS**

BIG RIVER SAND COMPANY SUPERFUND SITE

Compound	Concentration (ug/L)							
	Sample Number							
	B101S	B102S	B102D	E101S	E101S (Duplicate)	E101D	E102S	E102D
Arsenic (PP)	<10	15	<10	<10	<10	<10	<10	<10
Barium	550	330	220	110*	110*	110*	440	110*
Calcium	81,000	210,000	89,000	130,000	130,000	120,000	97,000	77,000
Chromium (PP)	18	31	34	24	24	25	30	27
Iron	4,200	7,400	6,300	5,700	5,900	7,000	19,000	4,500
Lead (PP)	<5.0	<5.0	<5.0	5.0	5.0	10	10	<5.0
Magnesium	7,700	22,000	16,000	24,000	24,000	20,000	14,000	13,000
Manganese	200	210	160	140	140	170	290	46
Potassium	2,600*	3,300*	4,300*	3,100*	3,100*	4,100*	4,000*	4,000*
Selenium (PP)	<5.0	<5.0	<5.0	61	62	<5.0	<5.0	<5.0
Sodium	120,000	80,000	190,000	74,000	73,000	110,000	41,000	160,000
Zinc (PP)	<20.0	<42	<34	<31	<32	<54	66	<36

* = Actual concentration, but less than CLP contract required detection limits.

(PP) = Priority Pollutant.

Table 2-6

TABLE OF DISSOLVED METAL CONCENTRATIONS IN
GROUNDWATER SAMPLES FROM MONITORING WELLS

BIG RIVER SAND COMPANY SUPERFUND SITE

Compound	Concentration (ug/L)							
	Sample Number							
	B101S	B102S	B102D	E101S	E101S (Duplicate)	E101D	E102S	E102D
Arsenic (PP)	<10.0	14	<10	<10	<10	<10	<10	<10
Barium	550	330	110*	220	110*	110*	330	110*
Calcium	79,000	210,000	91,000	120,000	130,000	120,000	97,000	77,000
Chromium (PP)	14	27	14	15	26	15	28	24
Iron	6,000	4,400	3,100	220.	3,400	2,700	14,000	3,200
Lead (PP)	<5.0	<5.0	<5.0	5.0	<5.0	<5.0	7.0	<5.0
Magnesium	7,900	21,000	15,000	23,000	24,000	19,000	14,000	13,000
Manganese	290	160	130	45	96	140	230	<33.0
Selenium (PP)	<5.0	<5.0	<5.0	61	57	<5.0	<5.0	<5.0
Sodium	110,000	82,000	190,000	73,000	73,000	110,000	38,000	150,000
Tin	<40.0	<400	<400	<400	<400	<400	<40	<40
Zinc (PP)	<25	<30	<47	<32	<52	<54	71	<48

* = Actual concentration, but less than CLP contract required detection limits.

(PP) = Priority Pollutant.

Table 2-7

TABLE OF TOTAL METAL CONCENTRATIONS IN
PRIVATE WELL GROUNDWATER SAMPLES

BIG RIVER SAND COMPANY SUPERFUND SITE

Compound	Concentration (ug/L) Sample Number		
	PW#1	PW#2	PW#3
Barium	220	<200	110*
Calcium	76,000	71,000	84,000
Chromium (PP)	<10	<10	11
Magnesium	8,500	10,000	10,000
Manganese	<15	560	<15
Sodium	150,000	160,000	190,000

* = Actual concentration, but less than CLP contract required detection limits.

(PP) = Priority Pollutant.

Table 2-8

TABLE OF DISSOLVED METAL CONCENTRATIONS DETECTED IN
PRIVATE WELL GROUNDWATER SAMPLES

BIG RIVER SAND COMPANY SUPERFUND SITE

Compound	Concentration (ug/L)		
	Sample Number		
	PW#1	PW#2	PW#3
Barium	330	<200	220
Calcium	76,000	73,000	86,000
Magnesium	8,600	10,000	10,000
Manganese	<15	560	<15
Sodium	150,000	160,000	190,000

* = Actual concentration, but less than CLP contract required detection limits.

Table 2-9

COMPARISON OF NORMALIZED GROUNDWATER SAMPLE CONCENTRATIONS
BIG RIVER SAND COMPANY SUPERFUND SITE

Compound	Normalized Concentration							PW#1	PW#2	PW#3
	B101S	B102S	B102D	E101S	E101D	E102S	E102D			
Arsenic (PP)	1.00	1.50	<1.00	<1.00	<1.00	<1.00	<1.00	1.00	1.00	1.00
Barium	1.00	0.60	0.40	0.20	0.20	0.80	<0.20	0.40	0.36	0.2
Calcium	1.00	2.59	1.10	1.60	1.48	1.20	0.95	0.94	0.88	1.04
Chromium (PP)	1.00	1.72	1.89	1.33	1.39	1.67	1.50	0.56	0.56	0.61
Iron	1.00	1.76	1.50	1.36	1.67	4.52	1.07	0.02	0.02	0.02
Lead (PP)	1.00	<1.00	<1.00	1.00	2.00	2.00	<1.00	1.00	1.00	1.0
Magnesium	1.00	2.86	2.08	3.12	2.60	1.82	1.69	1.10	1.30	1.3
Manganese	1.00	1.05	0.80	0.70	0.85	1.45	0.23	0.07	2.80	0.07
Potassium	1.00	1.27	1.65	1.19	1.58	1.54	1.54	1.65	1.42	1.04
Selenium (PP)	1.00	<1.00	<1.00	12.20	<1.00	<1.00	<1.00	1.00	1.00	1.0
Sodium	1.00	0.67	1.58	0.62	0.92	0.34	1.33	1.25	1.33	1.58
Zinc (PP)	1.00	<2.10	<1.70	<1.55	<2.70	3.30	<1.80	1.05	1.00	2.55
Sum:	12.0	<18.12	<15.70	<25.87	<17.39	<20.64	<13.31	10.05	12.67	11.42
Mean:	1.00	<1.51	<1.31	<2.16	<1.45	<1.72	<1.11	0.75	0.97	0.87

(PP) = Priority pollutant.

(<) Symbol used to denote compound was reported at actual concentration and was below the detection limits.

- Notes: 1. Background sample concentration from monitoring well B101S.
2. Table is for normalized total metal concentrations.

Table 4-1

**1987 AND 1995 TOTAL METAL CONCENTRATIONS IN GROUNDWATER
BIG RIVER SAND COMPANY SITE, WICHITA, KANSAS**

			B101S		E101S		E102S		Eisenring Shop		Eisenring Residence	
	MCL	SMCL	1987	1995	1987	1995	1987	1995	1987	1995	1987	1995
Arsenic	50.0	-	< 10.0	< 50.0	< 10.0	NA	< 10.0	< 50.0	< 10.0	< 50.0	< 10.0	< 50.0
Barium	2000.0	-	550.0	267.0	110.0	NA	440.0	340.0	220.0	298.0	< 200.0	163.0
Calcium	-	-	81,000.0	50,960.00	130,000.0	NA	97,000.0	108,910.0	76,000.0	56,800.0	71,000.0	41,360.0
Chromium	100.0	-	18.0	< 10.0	24.0	NA	30.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Iron	-	300.0	4200.0	36.0	5700.0- 5900.0	NA	19,000.0	49.0	< 100.0	114.0	< 100.0	602.0
Lead	50.0	-	< 5.0	< 50.0	< 5.0	NA	10.0	< 50.0	< 5.0	< 50.0	< 5.0	< 50.0
Magnesium	-	-	7700.0	4820.0	24,000.0	NA	14,000.0	9170.0	8500.0	11,730.0	10,000.0	7300.0
Manganese	-	50.0	200.0	12.0	140.0	NA	290.0	44.0	< 15.0	694.0	560.0	821.0
Potassium	-	-	2600.0	4050.0	3100.0	NA	4000.0	5070.0	4300.0	9460.0	3700.0	7600.0
Selenium	50.0	-	< 5.0	2.07	61.0-62.0	NA	< 5.0	< 2.0	< 5.0	< 2.0	< 5.0	< 2.0
Sodium	-	-	120,000.0	54,280.0	73,000.0- 74,000.0	NA	41,000.0	162,930.0	150,000.0	181,160.0	160,000.0	185,880.0
Zinc	-	5000.0	< 20.0	41.0	< 31.0- < 32.0	NA	66.0	41.0	< 21.0	46.0	< 20.0	275.0

Abbreviations

NA = Not Analyzed
 MCL = Maximum Contaminant Level
 SMCL = Secondary Maximum Contaminant Level

All units reported in micrograms per liter ($\mu\text{g/L}$)

